

**WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY**  
Control No. (TCN) 08152 with Battelle Chapel Hill Operations for the U.S. Army Environmental Policy Institute

**DECEMBER 2009 REPORT**

Note to Readers: Pages 1-16 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 17.

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**Item 1. “Copenhagen Accord” Brokered by President Obama at UN Climate Change Conference Is a Step Forward in Negotiations—Next Stop Mexico**

The UN Conference on Climate Change in Copenhagen was attended by over 100 heads of state and government, representatives of 193 nations and between 40,000 and 100,000 people from around the world came to participate in side events. The December 7–18, 2009 set of conferences and meetings resulted in a non-binding 12-paragraph Copenhagen Accord that calls for international cooperation to limit atmospheric CO<sub>2</sub> to 450 parts per million to make sure global warming does not rise more than 2°C, that developed and developing nations set carbon reduction targets that are internationally verifiable, that developed countries provide funds approaching USD 30 billion for the period 2010 to 2012 for developing countries with balanced allocation between adaptation and mitigation, and that developed countries mobilize USD 100 billion a year by 2020 to address the needs of developing countries. However, the original objective was not achieved: to adopt a treaty that would extend or replace the 1997 Kyoto Protocol in order to reduce greenhouse gas emissions and address global climate change.

The Conference and the numerous side-events generated an extraordinary wealth of information regarding challenges and potential strategies for addressing global climate change and set the stage for further negotiations. The next round of climate talks is scheduled for November 2010 in Mexico.

Note: Some scientists warn that lack of clear targets and commitments might raise CO<sub>2</sub> concentrations to around 700 parts per million (compared to 450 ppm that scientists consider the limit for keeping global warming below 2°C), meaning a potential warming by 3.5°C by 2100. The International Energy Agency estimates that about \$10.5 trillion in additional investment is needed by 2030 for setting the world on the path to low-carbon development.

**Military Implications:**

The military should produce a plan with special attention to AFRICOM to respond to the third point of the Copenhagen Accord brokered by President Obama that calls for... “Enhanced action and international cooperation on adaptation...and building resilience in developing countries...especially...Africa. Relevant military personnel should review the documents of the Copenhagen Conference to identify opportunities for implementing the Army Strategy for the Environment, military-to-military activities to build adaptation capacities, and other military and their contractors’ responsibilities to implement the Copenhagen Accord around the world.

**Sources:** (see a more expanded list in the [Appendix](#))

Copenhagen Accord. Draft decision -/CP.15 Proposal by the President. Conference of the Parties, Fifteenth session, Copenhagen, 7-18 December 2009

<http://unfccc.int/resource/docs/2009/cop15/eng/107.pdf>

Summary of the Copenhagen Climate Change Conference

<http://www.iisd.ca/vol12/enb12459e.html>

The Copenhagen climate change summit. *New Scientist's* full coverage

<http://www.newscientist.com/special/copenhagen-climate-change-summit>

**Item 2. Seven Tipping Elements That Could Transform the Planetary Systems**

Increasingly, scientists agree on some tipping elements that are extremely sensitive to climate shifts and therefore might have an important impact on the planetary systems. “The problem with

tipping elements is that if any of them tips, it will be a real catastrophe,” notes Anders Levermann, climate physicist at the Potsdam Institute for Climate Impact Research in Germany. The seven tipping elements considered are:

- Polar sea ice—passing a potential warming tipping point might cause serious loss of ice sheets and associated sea-level rise
- Amazon rainforest—increased weather-altering deforestation after passing a critical deforestation point
- Chad Bodélé Depression—substantial increase in dust production from the 10,000 square mile Saharan plain that now puts 700,000 tons of dust into the atmosphere annually
- South Asian Monsoons—amplified monsoon systems triggered by increased heat
- The Gulf Stream—due to lack of good models, the IPCC’s estimate of 10% Gulf Stream slowdown during the 21<sup>st</sup> century is uncertain
- Seafloor methane—increased release of methane (a powerful greenhouse gas) from methane hydrate in the seafloor, due to warming over a tipping point
- The Future—unknown features that could trigger radical changes

Scientists point out that an additional important unknown element is the interaction of these and other known elements.

**Military Implications:**

The military should identify improvements to interactive dynamic models of such tipping points to produce improved simulations, so that alternative futures could be explored for changes in training, R&D requirements, and military-to-military cooperation.

**Sources:**

Tipping elements in the Earth System. Hans Joachim Schellnhuber, PNAS December 8, 2009, vol. 106, no. 49, 20561-20563

<http://www.pnas.org/content/106/49/20561.full>

7 Tipping Points That Could Transform Earth

<http://www.wired.com/wiredscience/2009/12/tipping-elements/all/1>

**Item 3. Emerging International Packaging Standards to Reduce Environmental Footprints**

The first meeting of the ISO TC122 SC4 Packaging and Environment committee was held in Stockholm to begin work on standards for reducing the environmental footprint of packaging. The standards will cover source reduction, reuse, recycling, energy recovery, chemical recovery, composting and biodegrading, and a seventh overall standard. The new international standards are expected to be finalized by mid-2012 and to consider existing packaging and environmental standards already in use in Europe and Asia.

**Military Implications:**

The military and its contractors should monitor the development of the new standards for potential impacts on military logistics operations, and to plan for any necessary changes.

**Sources:**

Creation of International Packaging Standards Begins

<http://www.greenbiz.com/news/2009/12/10/creation-international-packaging-standards-begins>

TC 122/SC 4 Packaging and Environment

[http://www.iso.org/standards\\_development/technical\\_committees/other\\_bodies/iso\\_technical\\_committee.htm?commid=52082](http://www.iso.org/standards_development/technical_committees/other_bodies/iso_technical_committee.htm?commid=52082)

#### **Item 4. Studies Show Increased Hazards from Some Types of Airborne Particles**

Latest research reveals that certain kinds of airborne metallic microparticles, such as nickel, vanadium, and carbon, appear to pose a much higher toxic risk than other materials, putting acute stress on the lungs and heart. Low grade oil, such as is used in diesel trucks and space heaters, is a major source in urban areas. Scientists stress that more work needs to be done to study the relationships between particulate composition and biological harm.

##### **Military Implications:**

Military personnel concerned with airborne pollutants should to follow these researches in order to properly prioritize abatement efforts. Additionally, more conclusive evidences of potential harm from some particulate matters might trigger modifications to related international regulations.

##### **Source:**

Heavy metal: Some airborne particles pose more dangers than others

<http://www.environmentalhealthnews.org/ehs/news/metal-particles>

#### **Item 5. Technological Advances with Environmental Security Implications**

##### **5.1 New Detection and Cleanup Techniques**

###### 5.1.1 New Laser-based Gas Sensor Is Tunable over Wide Wavelength Range

A new type of optical gas sensor, using vertical-cavity, surface-emitting semiconductor laser diodes (VCSELs) has the important property of being tunable over a 5 nm spectral range, and thus able to detect a variety of different gases. The technology is being developed by NEMIS, an EU FP6 project at the Walter Schottky Institut, Technische Universität München in Munich.

##### **Military Implications:**

The military should follow this development as it moves toward practical usage in environmental sensing systems.

##### **Sources:**

NEMIS (New Mid-Infrared Sources for Photonic Sensors)

<http://www.nemis.eu/>

Huge long-term potential for new breed of gas sensors

<http://www.nanowerk.com/news/newsid=13823.php>

###### 5.1.2 Ozone Bubbles Provide New Cleansing Technique

A new technique uses ozone bubbles to turn hydrocarbon [oil] content in water or soil into a form that can be retained by sand filtration, which is a conventional and economical process. This new method has been developed by Prof. Andy Hong of the University of Utah, and is expected to be commercialized by Miracotech, Inc. of Albany CA.

**Military Implications:**

The military should investigate this technique as a possible tool for environmental cleanup.

**Source:**

Tiny Bubbles Clean Oil from Water. New Method Targets Oil Sheen, Other Pollutants

<http://unews.utah.edu/p/?r=111209-1>

**5.1.3 New Water Purifying Filter Requires No Energy or Running Water**

Tata Chemicals, of Mumbai/Kolkata, India, has announced the release of ‘Tata Swach’, a water purifier unit that requires no energy or running water to operate. The unit uses a replaceable cartridge packed with a purification medium that kills bacteria and disease-causing organisms. The cartridge can purify up to 3000 liters of water, after which it stops water flow.

**Military Implications:**

The military should investigate this unit as a possible water source in difficult environments.

**Source:**

Tata Chemicals launches ‘Tata Swach’

<http://www.tata.com/media/releases/inside.aspx?artid=TtOdcdNuSRk=>

**5.1.4 Nanotube-impregnated Paper Provides Sensitive Biosensor for Aqueous Toxins**

Prof. Nicholas Kotov, of the departments of Chemical Engineering, Materials Science and Engineering, and Biomedical Engineering at the University of Michigan, and associates from Jiangnan University, China, have developed a fast and inexpensive sensor for detecting toxins in water, using paper strips with several layers of single-walled carbon nanotube dispersion containing antibodies. The technique’s sensitivity is high—comparable with such current biochemical techniques as enzyme immunoassay and mass-spectrometry—and reportedly more than 25 times faster. Kotov explains that “The change of electrical response [conductivity] of the paper reflects the contents of the analyte”.

**Military Implications:**

The military should investigate the applications of these devices to assessment of environmental hazards in water.

**Sources:**

Simple nanotechnology paper sensor for detecting toxins in water

[http://www.nanowerk.com/spotlight/spotid=13913.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29](http://www.nanowerk.com/spotlight/spotid=13913.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29)

Simple, Rapid, Sensitive, and Versatile SWNT–Paper Sensor for Environmental Toxin Detection Competitive with ELISA

<http://pubs.acs.org/doi/abs/10.1021/nl902368r>

**5.2 New Technology to Measure Single Nanoparticles**

Prof. Lin Yang and his team at Washington Univ. have developed a “whispering-gallery-mode resonator” that provides a new degree of accuracy—1% to 2%—in the measurement of nanoparticle size. [Related item: *New Paper Suggests Concentrating Toxicity Studies on Smaller Nanoparticles* in the September 2009 environmental security report.]

**Military Implications:**

In view of the recent results on the effect of nanoparticle size on toxicity, the military should ensure that possible use of this new tool receives proper attention in nanotech risk assessment.

**Sources:**

Tiny whispering gallery: Sensor can detect a single nanoparticle and take its measurement

<http://www.physorg.com/news180363327.html>

On-chip single nanoparticle detection and sizing by mode splitting in an ultrahigh-Q microresonator

<http://www.nature.com/nphoton/journal/vaop/ncurrent/abs/nphoton.2009.237.html> (Abstract)

**5.3 NIST Awards Development Funding for Extended Sensor for Infrastructure Health**

Under its Technology Innovation Program, the National Institute of Standards and Technology has awarded development funding to Optellios, Inc. of Newtown PA for distributed fiber-optic sensing technology to enable real-time monitoring, identification, and location of disturbances and changes over long stretches of pipelines. Although the system is intended to detect and locate leaks, third-party actions, aging, and other disturbances in pipelines, it may also be applicable to other types of infrastructure.

**Military Implications:**

The military should follow this development in its application to avoiding environment-damaging conditions in linearly extended infrastructure elements.

**Source:**

Distributed Fiber-Optic Sensing Technology For Civil Infrastructure Management

<http://tipex.nist.gov/tippb/prjbriefs/prjbrief.cfm?ProjectNumber=090038>

**5.4 Increasing Energy Efficiency Technologies****5.4.1 ‘Energy Harvesting’ Offers Possibilities for Environment-sparing Power**

A team of researchers at the Department of Aerospace Engineering, University of Bristol, UK, are investigating technologies for ‘energy harvesting’—the gathering of energy from low amplitude vibrations that occur naturally in the environment, such as from machines or even the human body. Their research is directed at making use of a much larger variety of vibrations than is currently possible, by employing transducers that respond to a wider range of frequencies.

**Military Implications:**

The military should follow this research for its possible applicability to replacing batteries in systems with very low power requirements.

**Source:**

Pickin' Up Good Vibrations to Produce Green Electricity

<http://www.epsrc.ac.uk/PressReleases/harvester>

**5.4.2 New Dye-Sensitized Solar Cells Show Increase in Energy Conversion Efficiency**

A new type of dye yields dye-sensitized solar cells with a three-fold increase in energy conversion efficiency over current versions. The dye has been developed by researchers from Monash University and the University of Wollongong, Australia, and the University of Ulm, Germany.



**Military Implications:**

The military should investigate this new step forward in renewable energy technology.

**Source:**

Innovation puts next-generation solar cells on the horizon

[http://www.nanowerk.com/news/newsid=13777.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29](http://www.nanowerk.com/news/newsid=13777.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29)

**5.4.3 Genetically Engineered Bacteria Convert CO<sub>2</sub> to Liquid Fuel**

Scientists led by James C. Liao, Professor of Chemical and Biomolecular Engineering at UCLA's Henry Samueli School of Engineering and Applied Science, have genetically modified a cyanobacterium to consume CO<sub>2</sub> and use sunlight-driven photosynthesis to produce the liquid fuel isobutanol, which can potentially be used as a alternative to gasoline.

**Military Implications:**

The military should follow this development as a potential environment-friendly source of alternative energy.

**Source:**

Researchers engineer bacteria to turn carbon dioxide into liquid fuel

[http://www.nanowerk.com/news/newsid=13968.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29](http://www.nanowerk.com/news/newsid=13968.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29)

**5.4.4 Solid Oxide Fuel Cell Claims Reduced Lifecycle Cost**

Thomas Adams and Prof. Paul I. Barton of the MIT Chemical Engineering Dept. have proposed a design for a natural-gas-powered solid oxide fuel cell that they claim, under a favorable carbon pricing structure, has a lower lifecycle cost than present designs. Their system produces pure CO<sub>2</sub>, avoiding the step, presently required for carbon sequestration, of separating that gas from the total output stream.

**Military Implications:**

The military should investigate this development as a more environmentally friendly energy source.

**Source:**

A greener way to get electricity from natural gas

<http://web.mit.edu/newsoffice/2009/natural-gas.html>

High-efficiency power production from natural gas with carbon capture

[http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6TH1-4XJG5KY-3&\\_user=10&\\_rdoc=1&\\_fmt=&\\_orig=search&\\_sort=d&\\_docanchor=&view=c&\\_acct=C000050221&\\_version=1&\\_urlVersion=0&\\_userid=10&md5=56b56fc929eb0e36ed13f9567bbca539](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6TH1-4XJG5KY-3&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_docanchor=&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=56b56fc929eb0e36ed13f9567bbca539) (Abstract)

**5.4.5 Nano-infused Paper Substrate Improves Energy Storage Capabilities**

A research group at Stanford University, led by Yi Cui, assistant professor of materials science and engineering, has shown that paper coated with ink made of carbon nanotubes and silver nanowires makes a more durable component for flexible batteries and supercapacitors than the plastic used in previous experiments. According to Cui, "The paper supercapacitor may last through 40,000 charge-discharge cycles—at least an order of magnitude more than lithium



batteries. The nanomaterials also make ideal conductors because they move electricity along much more efficiently than ordinary conductors.” [Related item: *First Flexible Supercapacitor Built* in the April 2009 environmental security report]

**Military Implications:**

The military should follow this line of research as requirements increase for smaller and lighter electronic devices to be used in operational and environmental systems.

**Sources:**

Highly conductive paper for energy-storage devices

<http://www.pnas.org/content/early/2009/12/04/0908858106>

At Stanford, nanotubes + ink + paper = instant battery

<http://news.stanford.edu/news/2009/december7/nanotubes-ink-paper-120709.html>

**5.4.6 Thin Crystalline-Silicon Photovoltaic Cells Offer Many Advantages**

Scientists at Sandia National Laboratories have developed crystalline-silicon photovoltaic cells from 14 to 20  $\mu\text{m}$  thick and 0.25 to 1 mm across. According to the announcement, the new devices “are expected eventually to be less expensive and have greater efficiencies than current photovoltaic collectors that are pieced together with 6-inch-square solar wafers.” Further, “they use 100 times less silicon to generate the same amount of electricity,” and “Since they are much smaller and have fewer mechanical deformations for a given environment than the conventional cells, they may also be more reliable over the long term.” A major manufacturing convenience is that a very large number can be created from a single 12- or 18-inch diameter wafer, allowing defective cells to be individually discarded.

**Military Implications:**

The military should follow this development as a promising component for future alternative energy systems.

**Source:**

Glitter-sized solar photovoltaics produce competitive results

[http://www.sandia.gov/news/resources/news\\_releases/glitter-sized-solar-photovoltaics-produce-competitive-results/](http://www.sandia.gov/news/resources/news_releases/glitter-sized-solar-photovoltaics-produce-competitive-results/)

**Item 6. Updates on Previously Identified Issues****6.1 Climate Change****6.1.1 Scientific Evidence and Natural Disasters**

The past ten years have been the warmest in 160 years of recorded history, reveals preliminary data released by the UK Met Office based on temperature records from over 1,500 global monitoring stations. Similarly, based on preliminary data the World Meteorological Organisation announced that 2009 will be one of the ten warmest individual years recorded, with a temperature 0.44°C (0.79°F) above the long-term average of 14°C (57.2°F).

Preliminary disaster figures for 2009 show that over 75% of the people killed and 95% of the total affected by natural hazards were due to extreme weather events, says a joint press release by the UN International Strategy for Disaster Reduction, UNDP, and World Meteorological Organization. Although the 2009 statistics show lower figures compared to previous years,

Margareta Wahlström, UN Special Representative of the UN Secretary-General for Disaster Risk Reduction, warned that “extreme weather disasters remain top of the list and will continue to affect more people in the future.”

The Global Climate Risk Index 2010 (see world map in the [Appendix](#)) compiled by Germanwatch, shows that the top 10 countries most affected in the past 20 years by extremes of climate are: Bangladesh, Myanmar, Honduras, Vietnam, Nicaragua, Haiti, India, the Dominican Republic, Philippines, and China. The Global Climate Risk Index analyzes the impacts of weather-related loss events—mainly storms, floods and heat waves—and is based on the NatCatSERVICE database of Munich Re.

#### 6.1.2 Food and Water Security

The Pacific Institute’s recently updated online chronology of water conflicts shows 6 incidents during 2009, up from 3 in 2008. Peter Gleick, President of the Pacific Institute, notes that a pattern of localized conflict is likely to emerge in sub-Saharan Africa, Southeast Asia, India, China, Pakistan, and Burma in coming decades. Although skeptical about ‘water war’ or full-scale interstate warfare triggered by water, he suggests that water and climate change should still be considered serious security issues. Terrorist groups could start to view water infrastructure as valuable targets as tensions rise over water’s availability, says Gleick. In addition, in countries like Pakistan, discontent with the West could intensify as water becomes scarcer, which could help extremists bring in new recruits.

The UN Food and Agriculture Organization (FAO) collection of three technical papers provides an overview of the current status of knowledge on “Climate Change and Implications for Fisheries and Aquaculture,” noting that ecosystem approaches to aquaculture and fisheries, as well as precautionary management, can help improve the resilience of the sectors and calling for the integration of fisheries and aquaculture into national climate change and food security policies.

The UN World Water Assessment Programme released two publications: “The Implications of Climate Change for Water—Highlights on Climate Change from the third World Water Development Report” addressing the potential impacts of a changing climate on the availability of water and on the control of water extremes; and “Water and Climate Change—An Overview from the WWDR,” that underscores that water is at the root of a complex vulnerability dynamic and describes the impacts of climate change on water, making some recommendations for responses to climate change focused on water and proactive adaptation measures.

The study “Local Responses to Too Much and Too Little Water in the Greater Himalayan Region” by a consortium of international organizations, based on the work of five field teams in China, India, Pakistan and Nepal, highlights that adaptation practices need to be aligned with other processes if they are to be successful, even over a short period. It also stresses the need for governments to prioritize the development and improvement of national and regional policies to provide better support for local long-term resilience and adaptation to more extreme climate.

#### 6.1.3 Health

Two reports by the World Health Organization, “Global Health Risks” and “Protecting health from climate change: global research priorities,” assess the potential health implications related to climate change, with detailed global and regional estimates, and making some policy recommendations. Acknowledging that only some of the many potential effects of climate change are quantifiable, it underlines increased deaths from thermal extremes and weather disasters, vector-borne diseases, a higher incidence of food-related and waterborne infections, photochemical air pollutants and conflict over depleted natural resources. The WHO fact file, “10 Facts on Children’s Environmental Health,” summarizes environment-related causes and

conditions of the nearly three million annual deaths of children under five years old, underlying the increased risk of children of injuries and death from floods and extreme temperatures, asthma and respiratory diseases due to air pollution, and diarrheal diseases, malaria, and malnutrition.

#### 6.1.4 Melting Glaciers and Sea Ice

The report “Melting Snow and Ice: A Call for Action” notes that land ice melting is now becoming the dominant contributor to sea level rise, while receding glaciers threaten the livelihood of millions of people by inundation as well as decline of freshwater. The most important findings include: Greenland ice cap reduction rate tripled over the past decade; snow cover is diminishing, and glaciers from the Himalayas to the Alps are melting rapidly, with the greatest reductions in the Andes and the Rockies; while Antarctica, which seemed immune to global warming, now shows signs of net ice reduction on a similar scale to inland Greenland.

According to the report “Antarctic Climate Change and the Environment” by the Scientific Committee on Antarctic Research, although the bulk of the Antarctic ice sheet has shown little change, overall, 90% of the Peninsula’s glaciers have retreated in recent decades. While since 1980 there has been a 10% increase in Antarctic sea ice extent, particularly in the Ross Sea region, regional sea ice has decreased west of the Antarctic Peninsula. Loss of ice from the West Antarctic ice sheet might raise sea level by 1.4 meters (4ft 6in) by 2100, estimates the report.

According to a new study published in the journal *Geophysical Research Letters*, infragravity waves generated by ocean-storms could cause dramatic ice breakups far away from the storm’s origin, as the energy from the waves hitting a shore is echoed back into the sea for thousands of miles. Warming waters will likely aggravate the phenomena.

#### 6.1.5 Migration

In view of the fact that Pacific Islanders are among the most affected by climate change, UNHCR has partnered with other agencies to form a Pacific Humanitarian Protection Group, which will help map and analyze the protection needs of people in the region, and address disaster preparedness, mitigation and adaptation together.

Tuvalu, the fourth-smallest nation on Earth, might become the first country to be rendered unlivable by global warming. Nevertheless, the relocation of some Tuvalu communities has been well-managed so far, given its small population. However, the situation might get more difficult for the relocation of population from other areas vulnerable to climate change such as Africa’s Sahel, coastal Bangladesh, and Vietnam’s deltas. The displacement of those populations could be “a phenomenon of a scope not experienced in human history,” warns Koko Warner, an expert on climate change and migration at the United Nations University in Bonn.

A UNHCR working paper “Climate change, disaster, displacement and migration: initial evidence from Africa,” based on evidence from Burundi and Somalia, indicates that the frequency of climate-related disasters has increased in the past two decades and underscores that disasters and environmental degradation can trigger displacement and conflicts, which can further accentuate environmental degradation.

A report by the Norwegian Refugee Council, “Climate Changed: People Displaced” also explores who are affected by climate related displacement, and how they are assisted and protected, when displaced within the borders of their own country or across borders.

#### 6.1.6 Adaptation

“Climate Change, Conflict and Fragility”. a new report by International Alert, advises that adaptation strategies should be conflict sensitive and international responses to disasters and conflict should take into account the interlinked nature of the problems. Peace-building, for

example, needs to be climate-proofed by paying attention to the availability of resources such as water for agriculture which could be affected by climate change. Similarly, large amount of funds for adaptation given to vulnerable states could encourage warfare unless adequate attention is paid to the systems of power and political reality in these countries. Dan Smith, Secretary General of International Alert and co-author of the report, warned “there is an enormous risk that money will go astray and end up doing more harm than good.”

“Linking Climate Change Policies to Human Development Analysis and Advocacy” by UNDP aims to integrate human development analysis and advocacy into more equitable, sustainable and climate-resilient development planning and policy debates. The guidance note proposes a conceptual framework for the analysis and provides analytical data, policy and advocacy issues that can be adapted to regional and national contexts.

### 6.1.7 Climate Modeling and Scenarios

A new scenario developed by Climate Analytics to the request of Greenpeace Switzerland is forecasting global warming by considering the Swiss climate policy model at world level and linearly extending the policy trend up to 2020 to 2100. By these assumptions, global emissions peak at 60 Gt CO<sub>2</sub> in the 2050s, and drop below 50 Gt CO<sub>2</sub> by 2100. The best-estimate global warming in this scenario is 1°C by 2020, 1.8°C by 2050 and 3°C above pre-industrial by 2100.

### **Military Implications:**

[Same as previous on this issue] The military should identify all its resources and programs for reducing GHGs and responding to effects of climate change, update information continuously, forecast how it might be called upon for both mitigation and adaptation, and perform a gap analysis in anticipation of future requests. International discourse over climate change is increasing the development of international policies and strategies to mitigate and adapt to climate change.

**Sources:** (see a more expanded list in the [Appendix](#))

Global-average temperature data released

<http://www.metoffice.gov.uk/corporate/pressoffice/2009/pr20091208a.html>

Joint Press Release: 55 Million People Affected by Extreme Weather Disasters in 2009

[http://www.unisdr.org/preventionweb/files/12035\\_PRUNDPUNISDRWMOCCopenhagen14Dec2009.pdf](http://www.unisdr.org/preventionweb/files/12035_PRUNDPUNISDRWMOCCopenhagen14Dec2009.pdf)

Global Climate Risk Index 2010 - reflecting most severely affected countries over almost two decades

<http://www.germanwatch.org/presse/2009-12-08e.htm>

Water Conflict Chronology List

<http://www.worldwater.org/conflict/list/>

Special Report: Water and Climate Change - An Overview from the WWDR

<http://unesdoc.unesco.org/images/0018/001863/186318e.pdf>

Global Health Risks

[http://www.who.int/healthinfo/global\\_burden\\_disease/GlobalHealthRisks\\_report\\_full.pdf](http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf)

Melting Snow and Ice: A Call for Action

<http://www.regjeringen.no/en/dep/ud/Whats-new/news/2009/melting-snow-and-ice-a-call-for-action.html?id=587681>

Storm 'Echoes' Could Break Up Ice Shelves

<http://news.discovery.com/earth/storm-echoes-antarctica-ice-sheets.html>

Pacific islanders face the reality of climate change . . . and of relocation

<http://www.unhcr.org/4b264c836.html>

Climate Changed: People Displaced

<http://www.nrc.no/?did=9448676>

Climate Change, Conflict and Fragility

[http://www.international-alert.org/press/Climate\\_change\\_conflict\\_and\\_fragility\\_Nov09.pdf](http://www.international-alert.org/press/Climate_change_conflict_and_fragility_Nov09.pdf)

Linking Climate Change Policies to Human Development Analysis and Advocacy

[http://hdr.undp.org/en/media/Climate\\_Change\\_NHDR\\_Guidance\\_Note.pdf](http://hdr.undp.org/en/media/Climate_Change_NHDR_Guidance_Note.pdf)

Projected global warming under a worldwide climate policy following Switzerland's example

[http://www.greenpeace.ch/fileadmin/user\\_upload/Downloads/de/Klima/Klimastudie/2009\\_Stu\\_Projected\\_global\\_warming.pdf](http://www.greenpeace.ch/fileadmin/user_upload/Downloads/de/Klima/Klimastudie/2009_Stu_Projected_global_warming.pdf)

## **6.2 No Enforcement Mechanism Proposed for Strengthening the Bioweapons Treaty Due to “rapidly changing nature” of the threat.**

The 2009 Meeting of States Parties to the Biological Weapons Convention was held in Geneva, December 7–11, with focus on promoting capacity-building in the areas of disease surveillance, detection, diagnosis, and containment of infectious diseases. The new *National Strategy for Countering Biological Threats* presented by the U.S., although a comprehensive document designed to strengthen the Convention, doesn’t propose any international monitoring or enforcement system. A binding treaty on verification “would not be able to keep pace with the rapidly changing nature of the biological weapons threat,” noted Undersecretary of State Ellen Tauscher. [Related items: *U.S. Should Launch a New Biology Initiative* in October 2009, and *Biological Weapons Convention (BWC) Meeting Improves International Resilience Systems to Address Infectious Disease and BioWeapons* in August 2009 environmental security reports.]

### **Military Implications:**

Given the “rapidly changing nature of the biological weapons threat”, the military should explore new approaches for monitoring and enforcement of the BWC. In the absence of an adequate monitoring systems framework, relevant military personnel should increase collaboration with counterparts to improve internationally harmonized bio-control and response systems and the use of bio-nanosensor networks (some of which have been referenced in these monthly reports.)

**Sources:** (see an expanded list in the [Appendix](#))

President Obama Releases National Strategy for Countering Biological Threats

<http://www.whitehouse.gov/the-press-office/president-obama-releases-national-strategy-countering-biological-threats>

Biological Weapons Convention Meeting of States Parties Concludes in Geneva

[http://www.unog.ch/80256EDD006B9C2E/\(httpNewsByYear\\_en\)/77D5F2659E3558E5C125768C00324E30?OpenDocument](http://www.unog.ch/80256EDD006B9C2E/(httpNewsByYear_en)/77D5F2659E3558E5C125768C00324E30?OpenDocument)

## **6.3 China to Create an Emergency Environmental Management System**

China’s Vice Minister of Environmental Protection, Zhang Lijun, announced that one of the ministry’s priorities for 2010 is the creation of an environmental management system for addressing pollution and its effects. Reportedly, “environmental protection authorities at all levels should focus on the handling of mass disturbances triggered by environmental pollution such as water and soil pollution, and reduce the harm that pollution bring to people as much as possible.” A two-year nationwide campaign will be conducted to investigate all pollution-related threats, “which will gradually form a dynamic environmental management system,” says Zhang.

[Related item: *China's New Ministry of Environmental Protection* in March 2008 environmental security report.]

Note: A new poll of Chinese public opinion on 'What does China see as its greatest threat?' shows that Chinese are more concerned by the environment and domestic woes than potential geopolitical enemies. The study, conducted by the Lowy Institute for International Policy and the MacArthur Foundation, revealed that 75% of Chinese consider environmental problems such as climate change as a major threat to China's security, 67% consider water and food shortages, and 58% internal separatists, while only 50% thought the U.S. posed a security threat, and 45% are still worried about Japan.

**Military Implications:**

[Similar to previous on this issue] The environment should be a key focus of military-to-military relations with China. Its growing environmental problems could cause a variety of socio-economic instability conditions nationally and internationally. Relevant military personnel should consider applications of the Army Strategy for the Environment to increase cooperation with Chinese counterparts.

**Source:**

China to establish emergency environmental management system

[http://news.xinhuanet.com/english/2009-12/29/content\\_12725490.htm](http://news.xinhuanet.com/english/2009-12/29/content_12725490.htm)

Chinese See Environment As Biggest Security Threat

<http://blog.newsweek.com/blogs/wealthofnations/archive/2009/12/10/chinese-see-environment-as-biggest-security-threat.aspx>

#### **6.4 Toxic Compound Detected in Chlorinated Tap Water**

Xing-Fang Li and a team of scientists at the University of Alberta have discovered minute amounts (a few ng/l) of one of the toxic dichloroquinone compounds in chlorinated tap water. It is suspected that these compounds may pose a risk of bladder cancer. [Related item: *New Substances Identified as Harmful to Human Health and the Environment* in June 2009 environmental security report.]

**Military Implications:**

The military should follow this and related research to determine if changes are necessary in water treatment methods.

**Sources:**

A Toxic Disinfection By-product, 2,6-Dichloro-1,4-benzoquinone, Identified in Drinking Water

<http://www3.interscience.wiley.com/journal/123218235/abstract>

Tracing the traces: Nanogram concentrations of a toxic compound detected in chlorinated tap water

<http://www.physorg.com/news180767147.html>

#### **6.5 Environmental Effects from Flame Retardant Manufacturing Impurities**

A research team from Canada's National Laboratory for Environmental Testing has found that environmental pollution associated with the flame retardant Dechlorane Plus comes not only from that compound but from impurities introduced during its manufacture. [Related item: *Dechlorane Plus® Detected in Atmosphere* in January 2006 environmental security report.]



**Military Implications:**

In the analysis of environmental hazards, the military needs to take into account not only a principal polluting agent, such as Dechlorane Plus in this case, but also this indirect kind of source for the presence of other chemical pollutants.

**Source:**

Flame retardants are the suspected source of a new compound in the environment

<http://pubs.acs.org/doi/full/10.1021/es903688s>

**6.6 Greenhouse Gas Emissions Increase Ocean Noise Pollution**

New research reveals that oceans are becoming noisier due to declines of the concentration of chemicals that absorb sound as result of ocean acidification caused by increased concentrations of CO<sub>2</sub>. Model simulations show that increased acidity could reduce sound absorption (mostly of lower frequency range) by 60% by 2100 in high latitude oceans, potentially affecting marine life. The study, published in the journal *Nature Geoscience*, was conducted by researchers at the University of Hawaii School of Ocean and Earth Science and Technology. [Related items: *Sonar Restrictions Debate Continues* in January 2008, and *New Measures for Improving Marine Environment* in July 2009 environmental security reports.]

**Military Implications:**

Although debate over the potential harmful effects of sonar continues, new research on the consequences of ocean pollution from shipping and greenhouse gas emissions might accelerate negotiations for new regulations.

**Sources:**

Ocean noise pollution turns up with greenhouse gas emissions

[http://www.starbulletin.com/news/20091227\\_Ocean\\_noise\\_pollution\\_turns\\_up\\_with\\_greenhouse\\_gas\\_emissions.html](http://www.starbulletin.com/news/20091227_Ocean_noise_pollution_turns_up_with_greenhouse_gas_emissions.html)

Oceans becoming noisier thanks to pollution

[http://www.khaleejtimes.com/DisplayarticleNew.asp?section=todaysfeatures&xfile=data/todaysfeatures/2009/December/todaysfeatures\\_December37.xml](http://www.khaleejtimes.com/DisplayarticleNew.asp?section=todaysfeatures&xfile=data/todaysfeatures/2009/December/todaysfeatures_December37.xml)

**6.7 Arctic “Pole of Peace” Suggested to Address Arctic Security Issues**

In view of the increasingly heated debate over the Arctic due to increased access to resources, a group of Arctic security experts suggest that the U.S. should take the lead in proposing that the central Arctic Ocean be declared a “pole of peace and international cooperation based on shared interests in environmental security,” and invite Canada, Denmark, Norway and Russia to endorse the initiative. This might address the controversies over sovereign rights and jurisdiction.

[Related items: *New Developments by Canada and the U.S. in Arctic Security* in August 2009 and other items in previous environmental security reports.]

**Military Implications:**

[Similar to previous on this issue] The likelihood of potential new roles for coalition forces in the region is increasing for both national security and protection of the ecosystems. Relevant military personnel should seek improved cooperation with their counterparts in other countries and international organizations in developing proactive strategies, regulations, and enforcement procedures.



**Sources:**

United States leadership needed in Arctic Ocean

[http://juneauempire.com/stories/120309/opi\\_531556737.shtml](http://juneauempire.com/stories/120309/opi_531556737.shtml)

**6.8 Nuclear Disarmament Dilemma Continues**

The US/Russia negotiations for a legal framework to replace the Strategic Arms Reduction Treaty (START I), which expired on December 5, 2009, are expected to be restarted in mid-January 2010. Meantime, they pledged to continue working “in the spirit” of the 1991 pact. Reportedly, a major cause of the delay in concluding a new treaty is disagreement over compliance verification mechanisms. However, failure to reach agreement before the next Review conference might jeopardize nuclear non-proliferation advancements.

Meantime, the UN General Assembly, acting on the recommendation of its Disarmament and International Security Committee, adopted 16 texts in the nuclear weapons category, including a resolution naming August 29 as the international day against nuclear tests; beginning of negotiations in 2010 for a treaty for banning fissile material use for nuclear weapons; and a renewed determination towards the total global elimination of nuclear weapons (adopted by an overwhelming margin, with only India and North Korea voting against, and Bhutan, China, Cuba, France, Iran, Israel, Myanmar and Pakistan abstaining).

The report “Eliminating Nuclear Threats: A Practical Agenda for Global Policymakers” by the International Commission on Nuclear Non-proliferation and Disarmament evaluates the threats and risks associated with the existing nuclear weapons, highlighting their potential use by accident, miscalculation or design, or falling into the hands of terrorist actors, and calls upon nations with nuclear arms to adopt a “no first use” stand, as well as a reduction of nuclear arsenal to 2,000 weapons by 2025, roughly 10% of today’s stockpile. The 230-page report compares nuclear weapons to climate change in terms of gravity, although underlining their much higher potential immediate impact. [Related item: *UN Security Council Resolution on the Comprehensive Nuclear Test Ban Treaty* in September 2009 environmental security report.]

**Military Implications:**

The military should continue to assess opportunities to facilitate the NPT negotiations and international cooperation to improve nuclear safety, as well as recommend policy, training, and institutional or physical changes to implement the resolution.

**Sources:** (see a more expanded list in the [Appendix](#))

START Talks to Continue in Geneva in January: Dec. 22 State Department Briefing

<http://geneva.usmission.gov/2009/12/23/start-talks/>

On Recommendation of First Committee, General Assembly Adopts 54 Texts, Sets Aside Four Weeks in 2012 to Hammer Out Legally Binding Arms Trade Treaty

<http://www.un.org/News/Press/docs/2009/ga10898.doc.htm>

Commission Report Launched in Tokyo: Towards a Nuclear Weapon Free World

[http://www.icnnd.org/releases/091215\\_report.html](http://www.icnnd.org/releases/091215_report.html)

**6.9 Nanotechnology Safety Issues**

More detailed descriptions of the following nanotechnology issues are in the [Appendix](#)

- NanoAssociation for Natural Resources and Energy Security (NANRES) formed ([more](#))
- Tunisia Sets Up Unit For Environmental Applications And Nanotechnology ([more](#))

- Nanotech Regulatory Document Archive launched ([more](#))
- List Of Experts in Nanotechnology Ethics Published ([more](#))
- Scientists Object to Generalized Nano-Hazard Statements ([more](#))
- UK Defra Committee Report on Nanosilver ([more](#))
- “Environmental and Human Health Impacts of Nanotechnology” report ([more](#))
- December 2009 Nano Magazine Features Nanotech Applications and the Military ([more](#))
- OECD Publishes Manufactured Nanomaterials: Roadmap for Activities During 2009 and 2010 ([more](#))
- NIOSH Updates Its Nanotechnology Web Resources ([more](#))
- New On-Line Nanotech Information Service ([more](#))
- “Nanoethics: Big Ethical Issues With Small Technology” includes Military applications as one of the topics ([more](#))
- Industry Silver Nanotech Group Opposes "New Material" Designation ([more](#))
- Conference Green Nano: Challenges of Sustainability Conference to be held in Germany in January 2010 ([more](#))

## **Item 7. Reports and Information Suggested for Review**

### **7.1 State of the World 2010 Calls for a New Paradigm in Addressing Security**

Worldwatch Institute’s annual report *State of the World 2010: Transforming Cultures; From Consumerism to Sustainability* is a comprehensive assessment of the strategies and measures necessary for improving humanity’s prospects by switching away from consumerism-based patterns. Concerning security, the report argues that as “it will become increasingly clear that the biggest threats to national security are not foreign armies or terrorist groups but the weakened state of the planet,” there will be important changes to the security and legal systems, including new concepts such as “Earth jurisprudence,” while a more balanced military-to-climate budget would “do more to protect people than the largest nuclear arsenal ever could, and in the process it will create additional economic opportunities and new openings to improve diplomatic relations between countries.” The recommendations include, inter alia, the establishment of global political institutions for guaranteeing security, and increasing use of environmental restoration, diplomacy, and cooperation for addressing conflict.

#### **Military Implications:**

The report is an overview of the potentially forthcoming changes in systems of values, including security, and thus could be a useful source of information for planning and strategy design.

#### **Source:**

State of the World 2010. Transforming Cultures: From Consumerism to Sustainability  
<http://blogs.worldwatch.org/transformingcultures/contents/>

### **7.2 Summary of European Battery Regulations Released**

The environmental consulting firm Enhesa has published its 2009 Batteries Report, with a detailed comparative analysis of the regulatory requirements, including take-back and disposal, in nine European countries compared to the EU Batteries Directive 2006/66/EC.

**Military Implications:**

Military logistics personnel in the European Theater should be familiar with these environmental regulations as they may apply to local suppliers.

**Sources:**

Enhesa Releases Battery Report 2009 Will Santa Claus break the law? The European Batteries Directive

[http://www.enhesa.com/en/docs/PressRelease\\_Enhesa\\_Batteries\\_final\\_200912.pdf](http://www.enhesa.com/en/docs/PressRelease_Enhesa_Batteries_final_200912.pdf)

Enhesa Batteries Report 2009

[http://www.enhesa.com/en/service/docs/Enhesa\\_Batteries\\_Report\\_2009.pdf](http://www.enhesa.com/en/service/docs/Enhesa_Batteries_Report_2009.pdf)

**7.3 Water Treatment Technologies for the Removal of High-Toxicity Pollutants**

“Water Treatment Technologies for the Removal of High-Toxicity Pollutants,” part of the NATO Science for Peace and Security Series C: Environmental Security, presents the proceedings of the NATO Advanced Research Workshop with the same name, held September 13–17, 2008 in Košice, Slovak Republic. It is an overview of problems related to high toxicity pollutants in the environment, especially in drinking waters, some technologies for water treatment, as well as policy aspects for increasing environmental security.

**Military Implications:**

Relevant military personnel should consider the book as a resource for addressing water pollution causes and treatment solutions.

**Source:**

Water Treatment Technologies for the Removal of High-Toxicity Pollutants.

[http://www.springerlink.com/content/978-90-481-3495-3?sa\\_campaign=email/NBA](http://www.springerlink.com/content/978-90-481-3495-3?sa_campaign=email/NBA)

## APPENDIX

### Reference Details

This Appendix contains expanded background information on some items.

#### **Item 1. “Copenhagen Accord” Brokered by President Obama at UN Climate Change Conference Is a Step Forward in Negotiations—Next Stop Mexico**

**Sources:** (a more expanded list)

Copenhagen Accord. Draft decision -/CP.15 Proposal by the President. Conference of the Parties, Fifteenth session, Copenhagen, 7-18 December 2009

<http://unfccc.int/resource/docs/2009/cop15/eng/107.pdf>

Summary of the Copenhagen Climate Change Conference

<http://www.iisd.ca/vol12/enb12459e.html>

U.N. climate talks end with bare minimum agreement

<http://www.reuters.com/article/idUSGEE5BB07F20091219>

Why did Copenhagen fail to deliver a climate deal?

<http://news.bbc.co.uk/2/hi/science/nature/8426835.stm>

Climate deal falls short of key goals

<http://www.washingtonpost.com/wp-dyn/content/article/2009/12/18/AR2009121800637.html>

The Copenhagen climate change summit. *New Scientist's* full coverage

<http://www.newscientist.com/special/copenhagen-climate-change-summit>

Copenhagen's Real Challenge: Technology to Meet the Targets

[http://www.time.com/time/specials/packages/article/0,28804,1929071\\_1929070\\_1946649,00.html](http://www.time.com/time/specials/packages/article/0,28804,1929071_1929070_1946649,00.html)

Internal Stresses Begin to Crack the Bloc of Developing Nations at Climate Talks

<http://www.nytimes.com/cwire/2009/12/17/17climatewire-internal-stresses-begin-to-crack-the-bloc-of-41204.html>

#### **Item 6. Updates on Previously Identified Issues**

##### **6.1 Climate Change**

**Sources:** (a more expanded list)

###### 6.1.1 Scientific Evidence and Natural Disasters

Global-average temperature data released

<http://www.metoffice.gov.uk/corporate/pressoffice/2009/pr20091208a.html>

Met Office figures confirm noughties as warmest decade in recorded history

<http://www.guardian.co.uk/environment/2009/dec/08/met-office-warmest-decade>

Joint Press Release: 55 Million People Affected by Extreme Weather Disasters in 2009

[http://www.unisdr.org/preventionweb/files/12035\\_PRUNDPUNISDRWMOCCopenhagen14Dec2009.pdf](http://www.unisdr.org/preventionweb/files/12035_PRUNDPUNISDRWMOCCopenhagen14Dec2009.pdf)

Global Climate Risk Index 2010 - reflecting most severely affected countries over almost two decades

<http://www.germanwatch.org/presse/2009-12-08e.htm>

### 6.1.2 Food and Water Security

Water Conflict Chronology List

<http://www.worldwater.org/conflict/list/>

Future Scarcity Seen Sparking Local Conflicts, Not Full-Scale Wars

<http://www.nytimes.com/gwire/2009/12/23/23greenwire-future-scarcity-seen-sparking-local-conflicts-62509.html>

Climate change implications for fisheries and aquaculture. Overview of current scientific knowledge

[http://www.fao.org/fileadmin/user\\_upload/newsroom/docs/i0994e.pdf](http://www.fao.org/fileadmin/user_upload/newsroom/docs/i0994e.pdf)

Fisheries and aquaculture: multiple risks from climate change

<http://www.fao.org/news/story/en/item/38060/icode/>

The Implications of Climate Change for Water - Highlights on Climate Change from the WWDR3

<http://unesdoc.unesco.org/images/0018/001863/186317E.pdf>

Special Report: Water and Climate Change - An Overview from the WWDR

<http://unesdoc.unesco.org/images/0018/001863/186318e.pdf>

Local Responses to Too Much and Too Little Water in the Greater Himalayan Region

[http://www.unep.org/PDF/PressReleases/Final\\_Adaptation\\_Synthesis\\_Report\\_lowres.pdf](http://www.unep.org/PDF/PressReleases/Final_Adaptation_Synthesis_Report_lowres.pdf)

Too Much or Too Little Water in the Himalayas

<http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=606&ArticleID=6408&l=en&t=long>

### 6.1.3 Health

Global Health Risks

[http://www.who.int/healthinfo/global\\_burden\\_disease/GlobalHealthRisks\\_report\\_full.pdf](http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf)

Protecting health from climate change: Global research priorities

<http://www.who.int/globalchange/publications/9789241598187/en/index.html>

WHO Factfiles: 10 facts on children's environmental health

[http://www.who.int/features/factfiles/children\\_environmental\\_health/facts/en/index9.html](http://www.who.int/features/factfiles/children_environmental_health/facts/en/index9.html)

### 6.1.4 Melting Glaciers and Sea Ice

Foreign Minister Støre and former Vice President Al Gore present report on melting ice at climate summit

<http://www.regjeringen.no/en/dep/ud/Whats-new/news/2009/melting-snow-and-ice-a-call-for-action.html?id=587681>

Antarctic Climate Change and the Environment

<http://www.scar.org/publications/occasionals/acce.html>

Carteret Islands: 'The sea is killing our island paradise'

<http://www.telegraph.co.uk/earth/carteret-islands/6771651/The-sea-is-killing-our-island-paradise.html>

Storm 'Echoes' Could Break Up Ice Shelves

<http://news.discovery.com/earth/storm-echoes-antarctica-ice-sheets.html>

### 6.1.5 Migration

Pacific islanders face the reality of climate change . . . and of relocation

<http://www.unhcr.org/4b264c836.html>

What Happens When Your Country Drowns?

<http://motherjones.com/environment/2009/11/tuvalu-climate-refugees>

## Paradise Sinking

<http://www.haaretz.com/hasen/spages/1132554.html>

Climate change, disaster, displacement and migration: initial evidence from Africa

<http://www.unhcr.org/4b18e3599.html>

Climate Changed: People Displaced

<http://www.nrc.no/?did=9448676>

### 6.1.6 Adaptation

Climate Change, Conflict and Fragility

[http://www.international-alert.org/press/Climate\\_change\\_conflict\\_and\\_fragility\\_Nov09.pdf](http://www.international-alert.org/press/Climate_change_conflict_and_fragility_Nov09.pdf)

Copenhagen: Creating a Climate for Conflict?

<http://abcnews.go.com/International/copenhagen-climate-change-fuel-armed-conflict/story?id=9277441>

Copenhagen climate conference: Cash for climate change could encourage warfare

<http://www.telegraph.co.uk/earth/copenhagen-climate-change-confe/6703640/Copenhagen-climate-conference-Cash-for-climate-change-could-encourage-warfare.html>

Linking Climate Change Policies to Human Development Analysis and Advocacy

[http://hdr.undp.org/en/media/Climate\\_Change\\_NHDR\\_Guidance\\_Note.pdf](http://hdr.undp.org/en/media/Climate_Change_NHDR_Guidance_Note.pdf)

### 6.1.7 Climate Modeling and Scenarios

Projected global warming under a worldwide climate policy following Switzerland's example

[http://www.greenpeace.ch/fileadmin/user\\_upload/Downloads/de/Klima/Klimastudie/2009\\_Stu\\_Projected\\_global\\_warming.pdf](http://www.greenpeace.ch/fileadmin/user_upload/Downloads/de/Klima/Klimastudie/2009_Stu_Projected_global_warming.pdf)

## 6.2 No Enforcement Mechanism Proposed for Strengthening the Bioweapons Treaty Due to “rapidly changing nature” of the threat.

**Sources:** (a more expanded list)

President Obama Releases National Strategy for Countering Biological Threats

<http://www.whitehouse.gov/the-press-office/president-obama-releases-national-strategy-countering-biological-threats>

National Strategy for Countering Biological Threats

[http://www.whitehouse.gov/sites/default/files/National\\_Strategy\\_for\\_Countering\\_BioThreats.pdf](http://www.whitehouse.gov/sites/default/files/National_Strategy_for_Countering_BioThreats.pdf)

U.S. Announces New Strategy for Biological Weapons Convention

[http://gsn.nti.org/gsn/nw\\_20091209\\_8157.php](http://gsn.nti.org/gsn/nw_20091209_8157.php)

Biological Weapons Convention Meeting of States Parties Concludes in Geneva

[http://www.unog.ch/80256EDD006B9C2E/\(httpNewsByYear\\_en\)/77D5F2659E3558E5C125768C00324E30?OpenDocument](http://www.unog.ch/80256EDD006B9C2E/(httpNewsByYear_en)/77D5F2659E3558E5C125768C00324E30?OpenDocument)

Biological Weapons Convention, Meeting of States Parties (7-11 December 2009)

[http://www.unog.ch/80256ee600585943.nsf/\(httpPages\)/f1cd974a1fde4794c125731a0037d96d?OpenDocument&ExpandSection=10#\\_Section10](http://www.unog.ch/80256ee600585943.nsf/(httpPages)/f1cd974a1fde4794c125731a0037d96d?OpenDocument&ExpandSection=10#_Section10)

US wants tough bioweapons ban, but no verification

[http://www.google.com/hostednews/ap/article/ALeqM5jGwVYFyDmzsqaU9U3\\_k53Y9TSVggD9CFTEI01](http://www.google.com/hostednews/ap/article/ALeqM5jGwVYFyDmzsqaU9U3_k53Y9TSVggD9CFTEI01)

## 6.8 Nuclear Disarmament Dilemma Continues

**Sources:** (a more expanded list)

START Talks to Continue in Geneva in January: Dec. 22 State Department Briefing

<http://geneva.usmission.gov/2009/12/23/start-talks/>

U.S.-Russia arms control treaty expires

<http://www.washingtontimes.com/news/2009/dec/05/arms-control-treaty-expires/>

START Talks to Continue, Leaders Order

[http://gsn.nti.org/gsn/nw\\_20091214\\_5756.php](http://gsn.nti.org/gsn/nw_20091214_5756.php)

U.S. hopes to sign new arms cuts accord with Russia by yearend

<http://en.rian.ru/world/20091209/157165081.html>

On Recommendation of First Committee, General Assembly Adopts 54 Texts, Sets Aside Four Weeks in 2012 to Hammer Out Legally Binding Arms Trade Treaty

<http://www.un.org/News/Press/docs/2009/ga10898.doc.htm>

Adoption of the Draft Resolution on Nuclear Disarmament Submitted by Japan to the United Nations General Assembly

[http://www.mofa.go.jp/announce/announce/2009/12/1197754\\_1148.html](http://www.mofa.go.jp/announce/announce/2009/12/1197754_1148.html)

Commission Report Launched in Tokyo: Towards a Nuclear Weapon Free World

[http://www.icnnd.org/releases/091215\\_report.html](http://www.icnnd.org/releases/091215_report.html)

Urgent call for nuclear arms cull

<http://www.theage.com.au/national/urgent-call-for-nuclear-arms-cull-20091213-kqih.html>

AUSTRALIA may be forced to acquire nuclear weapons to tackle deteriorating Asian security, a government-funded defence think tank has warned.

<http://www.theaustralian.com.au/news/nation/nation-given-n-bomb-warning/story-e6frg6nf-1225809977267>

## 6.9 Nanotechnology Safety Issues

More detailed descriptions of the nanotechnology issues

### 6.9.1 NanoAssociation for Natural Resources and Energy Security (NANRES) Formed

A group of nanotechnology-interested companies have formed the NanoAssociation for Natural Resources and Energy Security (NANRES), which, according to Nanowerk News, "is designed to advance the research, development, and commercialization of innovative energy and environmental-specific nanotechnologies."

#### **Military Implications:**

Nanotech-concerned military organizations should establish contact with the Association for the beneficial exchange of plans and information.

#### **Sources:**

NanoAssociation for Natural Resources and Energy Security (NANRES)

<http://www.nanres.org/>

New nanotechnology association established to address 21st century natural resource and energy security challenges

[http://www.nanowerk.com/news/newsid=13992.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29](http://www.nanowerk.com/news/newsid=13992.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29)



### 6.9.2 Tunisia Sets Up Unit for Environmental Applications and Nanotechnology

In Tunisia, the National Agency of Environmental Protection (ANPE) and the Tunisian Association of Nanotechnology have set up a partnership for the creation of a unit for nanotechnology research and environmental applications of nanotechnology.

#### **Military Implications:**

A military representative in Tunis should contact the partnership to arrange for exchange of information, and cooperation on nanotech issues between the two countries

#### **Source:**

Nanotechnology for the Environment

<http://www.tunisiaonlinenews.com/?p=30787>

### 6.9.3 Global Archive of Government Nanotech Documents Launched

The Center for the Study of Law, Science, & Technology at Arizona State University's Sandra Day O'Connor College of Law has launched the Nanotech Regulatory Document Archive, a global database of government documents on nanotechnology. Each document will be accompanied by an abstract. The archive will be set up as an edited wiki, and, notes Nanowerk News, "Documents for a specific jurisdiction can be accessed by clicking on a map or on a region, nation or entity."

#### **Military Implications:**

Military personnel concerned with nanotech regulation should familiarize themselves with this resource.

#### **Sources:**

Welcome to the Nanotech Regulatory Document Archive

<http://nanotech.law.asu.edu/>

First global nanotechnology regulation database launched

[http://www.nanowerk.com/news/newsid=13817.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29](http://www.nanowerk.com/news/newsid=13817.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29)

### 6.9.4 List of Experts in Nanotechnology Ethics Published

The ObservatoryNano project has published Experts NanoEthics and Ethical, Legal and Social Aspects of Nanotechnology [sic], a comprehensive list of personnel in the field. According to the announcement, it "includes senior academics and consultants, experienced in nanoethics or ethical, legal and social aspects of nanotechnology from different countries in Europe and the rest of the world ... [and in] addition, a list of junior experts including PhD students and young professionals". Each entry includes complete contact information and a note on area of expertise.

#### **Military Implications:**

Military personnel concerned with nanotech risk management should familiarize themselves with this resource.

#### **Source:**

Experts NanoEthics and Ethical, Legal and Social Aspects of Nanotechnology

<http://www.observatorynano.eu/project/document/2918/>

#### 6.9.5 Scientists Object to Generalized Nano-Hazard Statements

A group of distinguished scientists in the nanotechnology field have published an open letter in Nanotoxicology in order "to draw the attention of the nanotoxicology community to how the term 'nanoparticles' is being somewhat indiscriminately used, especially in the titles of scientific papers and in statements to the press." Their objection takes as an example "a recent paper that linked nanoparticles in the most general sense to seven very serious cases of occupational lung and pleural injury occurring in China. The exposures were not characterized, but histological assessment of lung biopsies and pleural fluid indicated the presence of nanoparticles with an unidentified origin or chemistry. Despite a lack of information on the nature of the nanoparticles, the research was published under the title 'Exposure to nanoparticles is related to pleural effusion, pulmonary fibrosis and granuloma' ". The panel strongly cautions all involved in communication of nanotech issues to consider the present uncertainties in the study of nanotech pathogenesis, to be precise in stating the technical bases and limitations of studies, and not to make such generalized statements as in the title cited above.

#### **Military Implications:**

Military personnel working in the nanotechnology field should both be alert for such poorly founded conclusions in material they review, and should be certain not to engage in such misleading labeling themselves.

#### **Source:**

Nanoparticles – one word: A multiplicity of different hazards

<http://informahealthcare.com/doi/full/10.3109/17435390903337701>

#### 6.9.6 UK Defra Committee Report on Nanosilver

The Advisory Committee On Hazardous Substances of the UK Department for Environment, Food and Rural Affairs (Defra) has issued its report on nanosilver. The paper (7 pp, with references) states that it reviews information and studies on the environmental exposure and effects of nanoparticulate silver, comments on known or predicted environmental exposure levels and whether these present a human health or environmental risk, and considers what action should be taken to further develop understanding in this area. It does not comment on risk management issues because of insufficient information and because those are the responsibility of the relevant policy and regulatory bodies.

#### **Military Implications:**

Military personnel concerned with nanotech risk assessment should review this paper.

#### **Source:**

Advisory Committee on Hazardous Substances Report on Nanosilver

<http://www.nanoforum.org/dateien/temp/achs-report-nanosilver.pdf?20112009112655>

#### 6.9.7 "Environmental and Human Health Impacts of Nanotechnology"

Topics covered in this ten-chapter book include: The properties, preparation and applications of nanomaterials; Characterization and analysis of manufactured nanoparticles; The fate and behaviour of nanomaterials in aquatic, terrestrial and atmospheric environments; Ecotoxicology and human toxicology of manufactured nanoparticles; Occupational health and exposure of nanomaterials; and Risk assessment and global regulatory and policy responses.

**Military Implications:**

Military personnel concerned with nanotech risk assessment should consider acquiring this book.

**Source:**

Environmental and Human Health Impacts of Nanotechnology

[http://www.researchandmarkets.com/reportinfo.asp?report\\_id=1083599&t=d&cat\\_id=](http://www.researchandmarkets.com/reportinfo.asp?report_id=1083599&t=d&cat_id=)

**6.9.8 December 2009 Nano Magazine Features Nanotech Applications and the Military**

Most of the December issue of the UK's *Nano Magazine* is devoted to articles on various aspects of the military use of nanotechnology.

**Military Implications:**

Military personnel involved with nanotech applications and risk assessment should consider reviewing the contents of this issue (available for purchase on-line).

**Source:**

*NANO Magazine*, issue 15, Published December 2009

<http://www.nanomagazine.co.uk/read.php?i=121>

**6.9.9 OECD Publishes Nanomaterials Roadmap and Information Gathering Analyses**

The Organisation for Economic Co-operation and Development has published *Manufactured Nanomaterials: Roadmap for Activities During 2009 and 2010*, which, according to Nanowerk News, "presents a brief description of the ways in which the Working Party on Manufactured Nanomaterials (WPMN) contributes to the overall objectives of the Environment, Health and Safety Programme (EHS), and the OECD as a whole." It has also issued *Analysis of Information Gathering Initiatives on Manufactured Nanomaterials*, which specifies a desirable set of information elements, and considerations and recommendations for countries planning such an activity, and summarizes existing efforts in seven countries.

**Military Implications:**

Military personnel involved in nanotech risk assessment should review these publications for useful ideas.

**Sources:**

OECD Nanomaterials Roadmap

[http://www.oilis.oecd.org/oilis/2009doc.nsf/LinkTo/NT00004E1A/\\$FILE/JT03269258.PDF](http://www.oilis.oecd.org/oilis/2009doc.nsf/LinkTo/NT00004E1A/$FILE/JT03269258.PDF)

OECD Information Gathering Analyses

[http://www.oilis.oecd.org/oilis/2009doc.nsf/LinkTo/NT00006F1E/\\$FILE/JT03274953.PDF](http://www.oilis.oecd.org/oilis/2009doc.nsf/LinkTo/NT00006F1E/$FILE/JT03274953.PDF)

OECD publishes manufactured nanomaterials roadmap 2010

[http://www.nanowerk.com/news/newsid=13990.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29](http://www.nanowerk.com/news/newsid=13990.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29)

**6.9.10 NIOSH Updates Its Nanotechnology Web Resources**

According to Nanowerk News, the National Institute for Occupational Safety and Health (NIOSH) has updated a number of its on-line publications and sites. They include:

*Progress Toward Safe Nanotechnology in the Workplace*, Publication No. 2010-104. Updates on 43 NIOSH projects on risk assessment, and on extramural research. <http://www.cdc.gov/niosh/docs/2010-104/default.html>

*Strategic Plan for NIOSH Nanotechnology Research and Guidance*, Publication No. 2010-105. Research planned by NIOSH for 2009-2012 <http://www.cdc.gov/niosh/docs/2010-105/default.html>  
NIOSH Nanotech Web Topic Page <http://www.cdc.gov/niosh/topics/nanotech/>  
Nanoparticle Information Library <http://www.cdc.gov/niosh/topics/nanotech/NIL.html>

**Military Implications:**

Nanotech-concerned military personnel should consider the updating their respective info.

**Source:**

NIOSH updates its nanotechnology web resources  
[http://www.nanowerk.com/news/newsid=13932.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+\(Nanowerk+Nanotechnology+News\)](http://www.nanowerk.com/news/newsid=13932.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+(Nanowerk+Nanotechnology+News))

**6.9.11 New On-line Nanotech Information Service**

Knovel, an online technical information company, has announced availability of subscriptions to its Nanotechnology collection, with content focused on nanoscale materials, nanostructure-dependent properties and phenomena data as well as fabrication and manufacturing techniques. It includes a section on Environmental Nanotechnology and Environmental Safety.

**Military Implications:**

Military personnel concerned with nanotech environmental issues should investigate the usefulness of this new resource.

**Source:**

Knovel Launches Nanotechnology Collection  
<http://why.knovel.com/company/press/345-knovel-launches-nanotechnology-collection-.html>

**6.9.12 New book: Nanoethics: Big Ethical Issues With Small Technology**

According to the *Nanowerk News* review, "This book explores in an accessible and informative way how nanotechnology is likely to impact the lives of ordinary people in the coming years and why ethical reflection on nanotechnology is needed now. Articulate, provocative and stimulating, this timely book will make a significant contribution to one of the most important debates of our time." Military applications is one of the topics discussed.

**Military Implications:**

Military personnel concerned with nanotech environmental issues should consider the report for potential inputs to their own work.

**Sources:**

Nanoethics Big Ethical Issues with Small Technology  
<http://www.continuumbooks.com/books/detail.aspx?BookId=132355&SearchType=Basic>  
Nanoethics: Big ethical issues with small technology  
[http://www.nanowerk.com/news/newsid=13819.php?utm\\_source=feedburner&utm\\_medium=email&utm\\_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29](http://www.nanowerk.com/news/newsid=13819.php?utm_source=feedburner&utm_medium=email&utm_campaign=Feed%3A+nanowerk%2FagWB+%28Nanowerk+Nanotechnology+News%29)

**6.9.13 Industry Silver Nanotech Group Opposes "New Material" Designation**

The Silver Nanotechnology Working Group (SNWG) has released the content of a presentation it made to EPA's Scientific Advisory Panel on the topic of "Evaluation of Hazard and Exposure

Associated with Nanosilver and Other Nanometal Oxide Pesticide Products". In it, the group stated that EPA has safely and successfully regulated these products for decades, and that "calls for treatment of nanosilver as a new material requiring development of expensive new test regimes and discriminatory regulatory consideration are difficult to justify."

**Military Implications:**

The military should follow the course of these discussions so as to be prepared for possible new regulatory measures.

**Source:**

Silver Nanotechnology Working Group: EPA Has Safely Regulated Nanosilver for Decades  
<http://www.silverinstitute.org/snwg.php>

6.9.14 Green Nano: Challenges of Sustainability Conference to Be Held in Germany

The Green Nano: Challenges of Sustainability - Saving Resources & Protecting Life conference will be held 26 - 27 January 2010 at DECHEMA-House, Frankfurt am Main, Germany. The program will include 21 talks, and poster presentations.

**Military Implications:**

Military personnel who are in the area and are concerned with nanotech applications and risks should consider attending this event.

**Source:**

Green Nano: Challenges of Sustainability. Frankfurt am Main, 26 - 27 January 2010  
<http://www.processnet.org/en/cnt10.html>

## Global Climate Risk Index 2010

### Global Climate Risk Index 2010 (covering 1990-2008)

Source: Germanwatch and Munich Re NatCatSERVICE®

